DEVELOPMENT ANALYSIS AND TESTING OF MARS MICROROVER MOBILITY

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Abstract

JPI. has been researching planetary vehicle mobility for tbc last several years. Early in the rover development, 2-D quasi-static analysis codes were developed to predict the performance and optimize geometry of NxN wheel symmetric vehicles over obstacles. The codes simulated the condition of impending motion, where all wheels receive the maximum traction available to them and the vehicle is in static equilibrium.

Vehicle attitude/articulation was studied using commercial codes for kinematic and dynamic motions. Prototypes of four different 6x6 vehicles were fabricated and tested as the design evolved, culminating in the rocker-bogic configuration. The computer codes were verified through square step and angled bump traverse tests.

Vehicle performance over natural terrain was qualitatively evaluated at a Mars-like site in the California desert. Controlled tests of slope performance were conducted in soil bins of dry sand and lunar-like basalt in the laboratory. Effects of ground pressure, wheel speed and tire flexibility were evaluated.

The results of this research have been incorporated into the design of a 10 kg Mars microrover which is part of the 1996 MESUR Pathfinder mission.

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